

Stormwater Landscape Approaches for CSO Abatement/Control

Weftec conference 2004

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Nature and life strive for beauty...
It is only with the heart that one can see clearly

(Adapted from Daisaku Ikeda and Antoine De Saint ~Exupery



Conventional Rooftops – cause heat, glare, polluted runoff and have been found to harbor mosquitoes



APR 10 2001

Roof Sediment Discharge



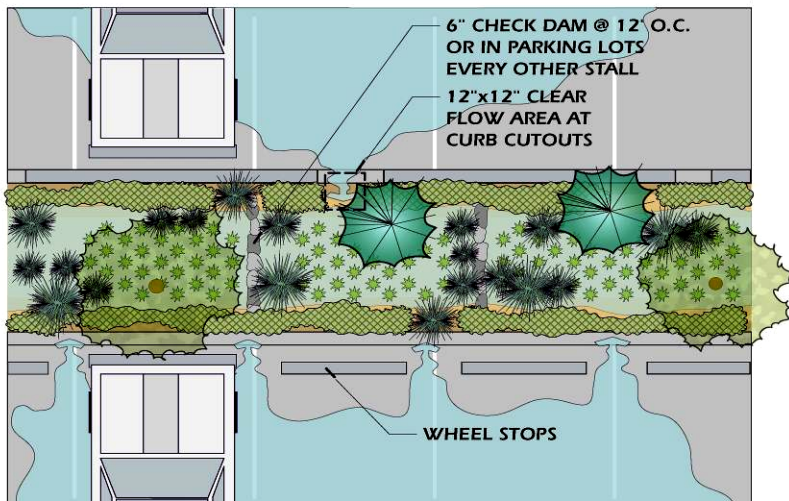
FEB 1 2002

Parking lots; new or retrofits

Landscape swales, infiltration gardens

flow through planters

LEGEND



Swale Area = Approx. 400 sq. ft.
(Not to Scale)

Notes:

1. At least 50% of the facility shall be planted with grasses or grass-like plants, primarily in the flow path.
2. Large grass like plants can be considered as shrubs. See BES recommended plant list and parking lot tree list and plant quantity requirements.

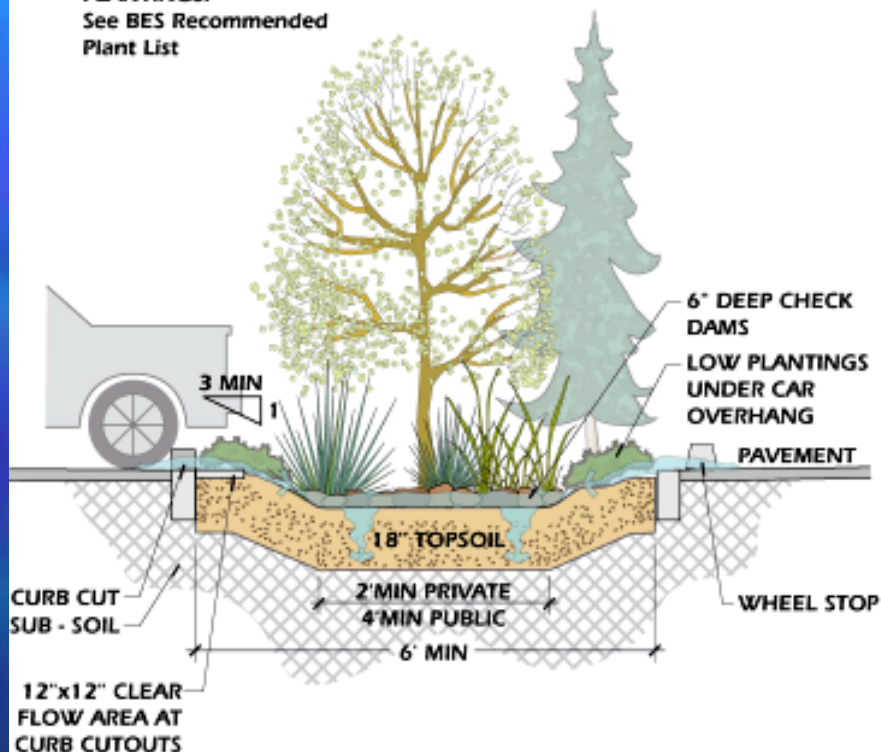
Vegetated Swale - Plan

Parking Lot Application

7/26/02

PLANTINGS:

See BES Recommended Plant List



Vegetated Swale

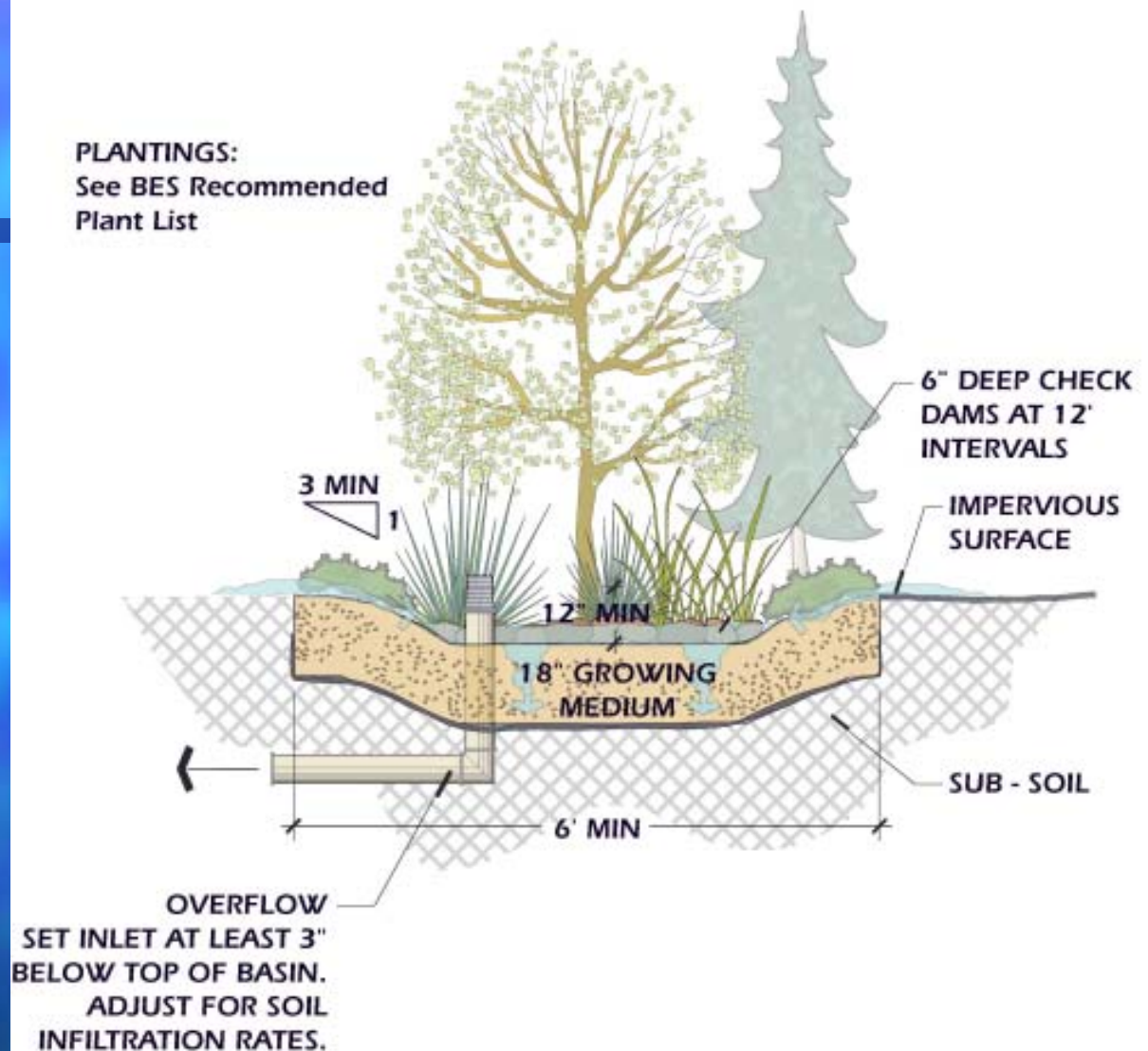
Parking Lot Application

7/26/02

Landscape Approaches

1. Remove and or prevent runoff into;
 - Combined Sewer System,
 - Receiving waters
 - Ms4;
 - Sewer Basement Backups,
2. Reduce infrastructure and O&M;
3. Improve neighborhoods and enhance livability.

Simplified Approach Vegetated Infiltration



Vegetated Infiltration Basin

Using Landscape Techniques to filter, detain, retain, cool, use, re-use, prevent and infiltrate runoff

LEGEND



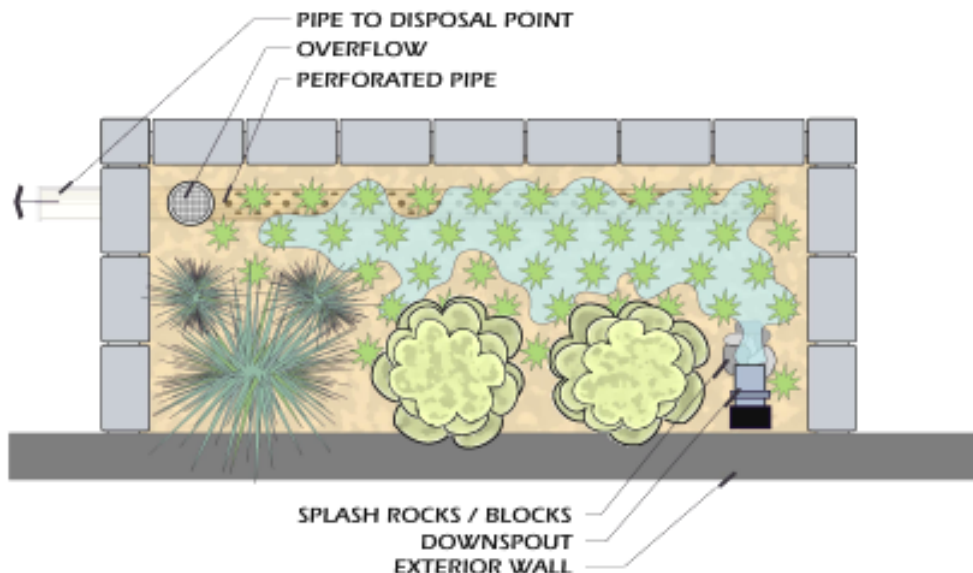
Large Shrub /
Small Tree



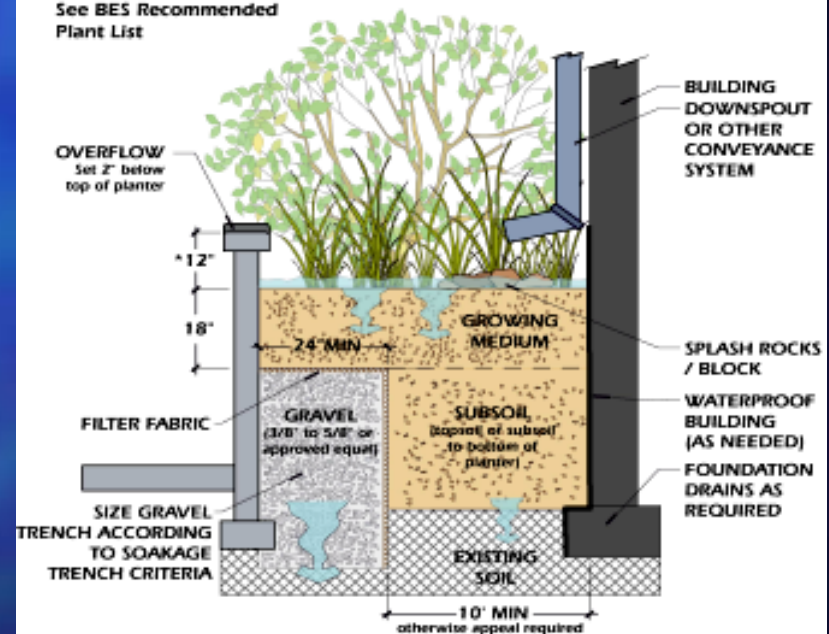
Shrub / Large
Grasslike Plants



Groundcover and
Grass / Grasslike
Plants



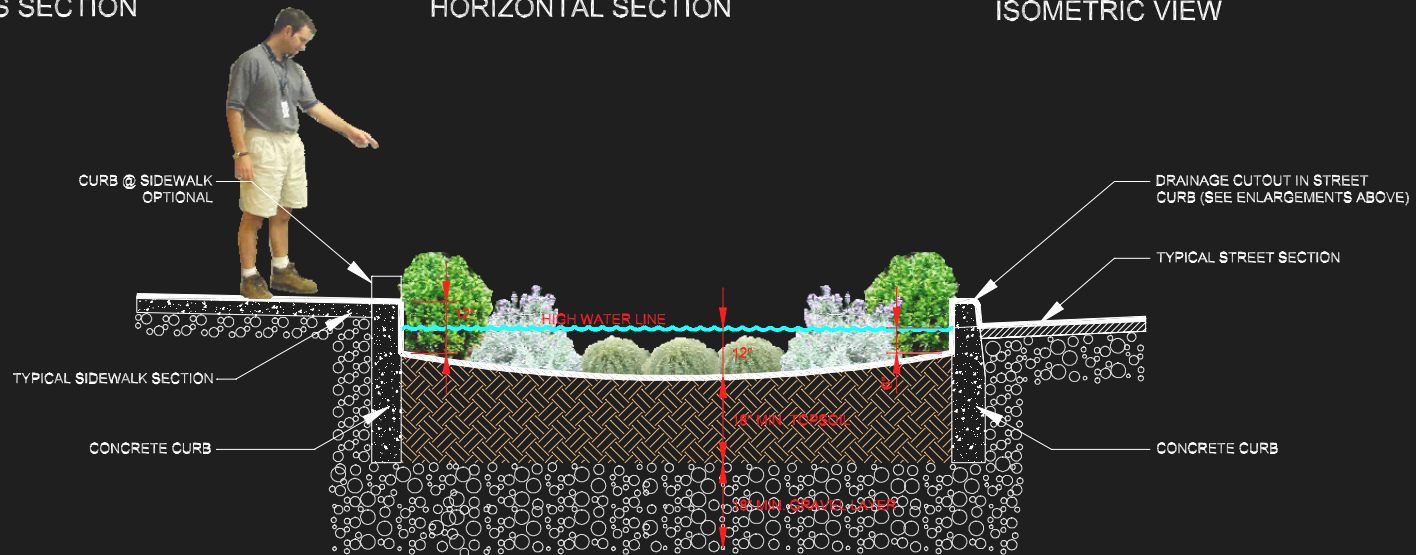
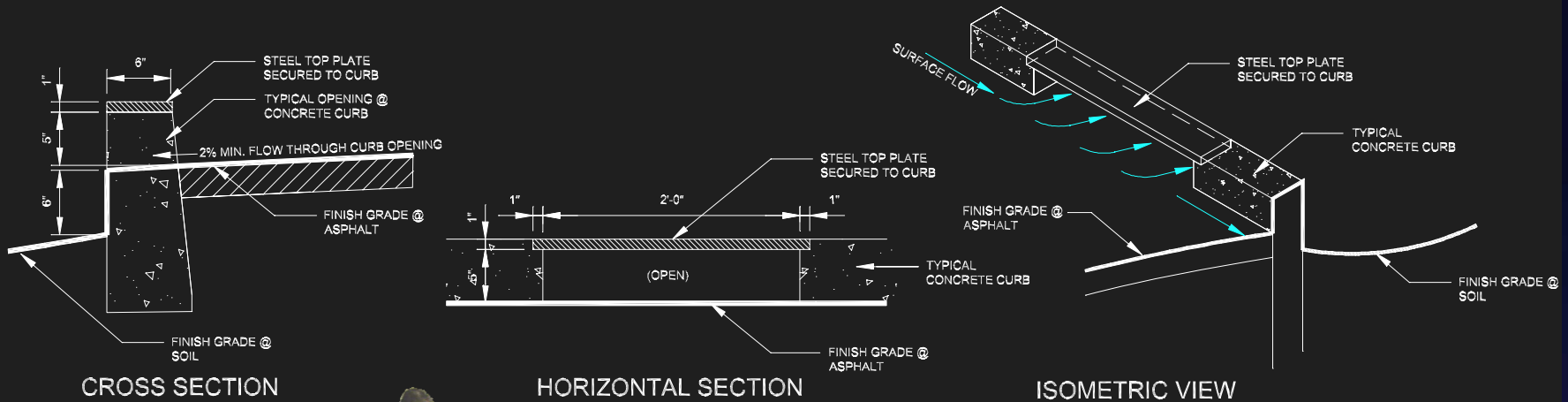
PLANTINGS:
See BES Recommended
Plant List



Infiltration Planter

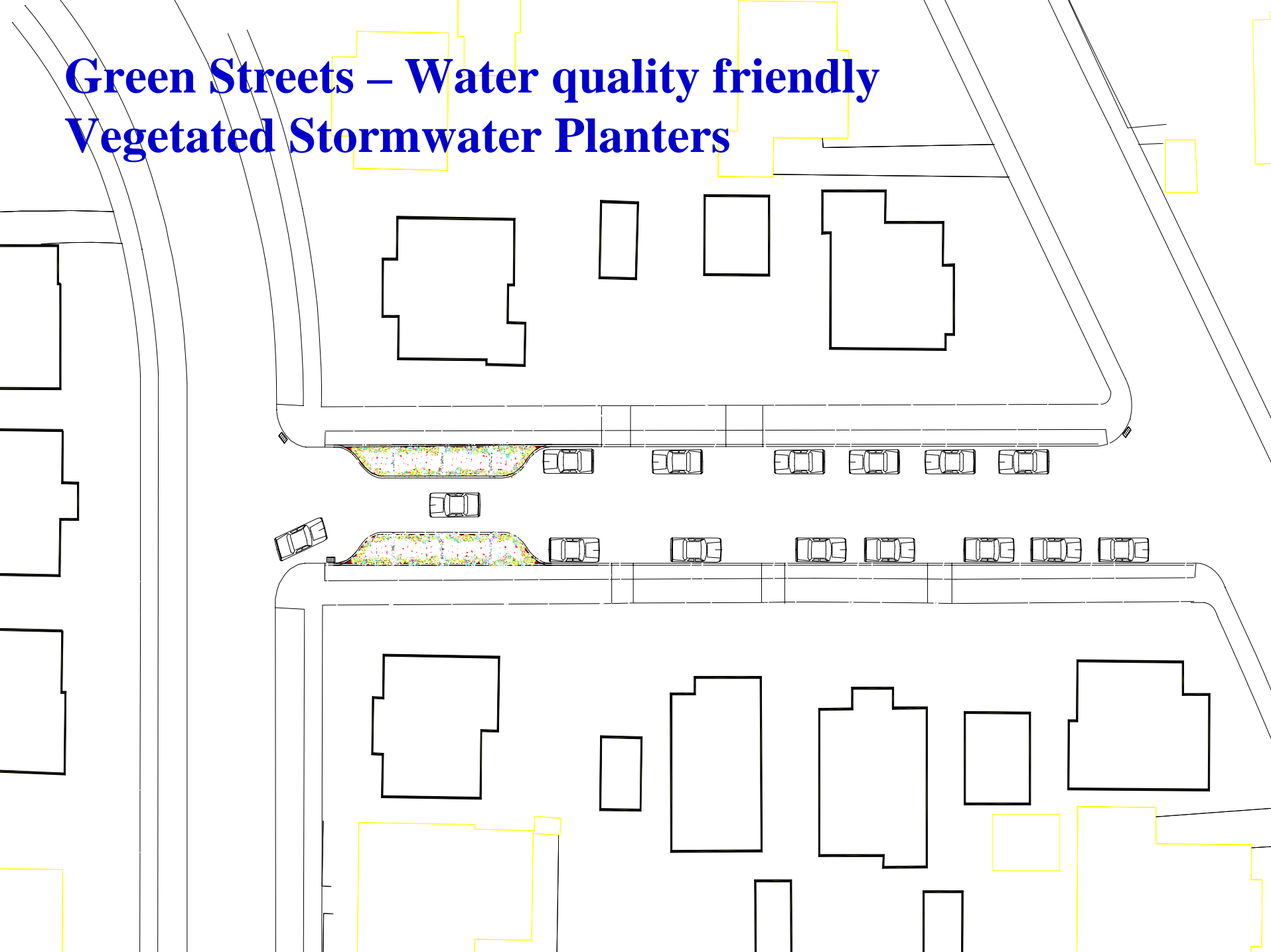
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Green Street Design

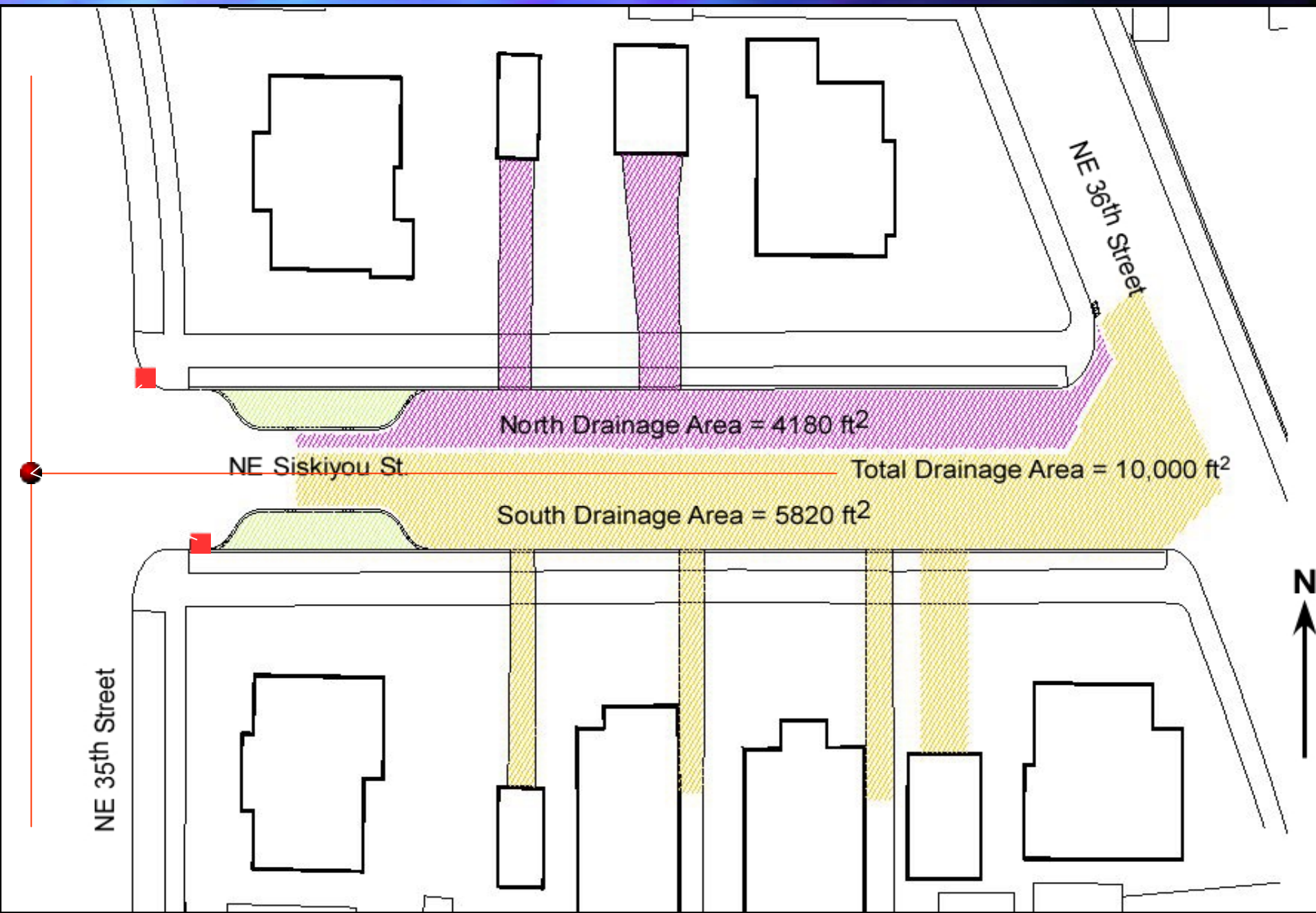


U R B A N G R E E N S T R E E T C O N C E P T S
T Y P I C A L S W A L E S E C T I O N

Green Streets – Water quality friendly Vegetated Stormwater Planters



Siskiyou Street Drainage Area to Combined Sewer System





Winter rain

Winter rain

03.05.2004



2004 1 11



First spring

03.16.2004





First Summer 2004

Siskiyou Street Test data

- Drainage area = 5,800 sf street and driveways. Sidewalks drain into grass parkway strips.
- Facility surface area = 357 sf vegetated area.
- Simulated ASFO storm = 1.4 inches/45 min = 2,396 gal. in-flow; 364 gal. out-flow
- Facility performance = 85% ASFO storm retained.
- Basement backup storm peak reduction 88%

Division Street

Landscape Planters
in sidewalk area take
Street runoff.
Commercial/Retail zone



Division Street Planters



New Season's Market







Buckman Heights Infiltration Gardens

MAY 18 2001



430

Buckman Heights Apartments – Infiltration garden

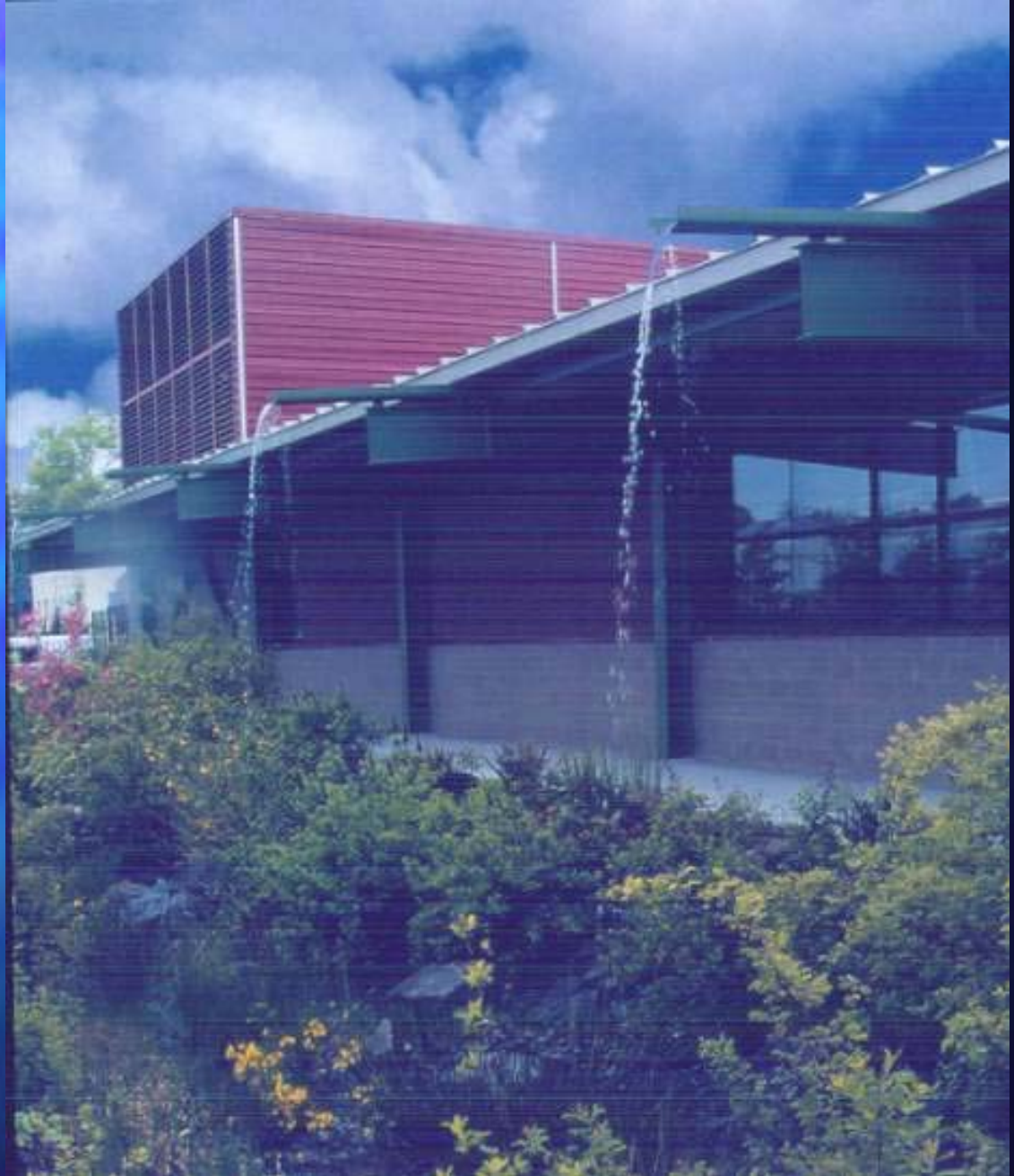
Buckman Terrace Apartments Stormwater Planters



MAY 16 2001

MAY 16 2001

Innovative ways to convey, manage and use stormwater

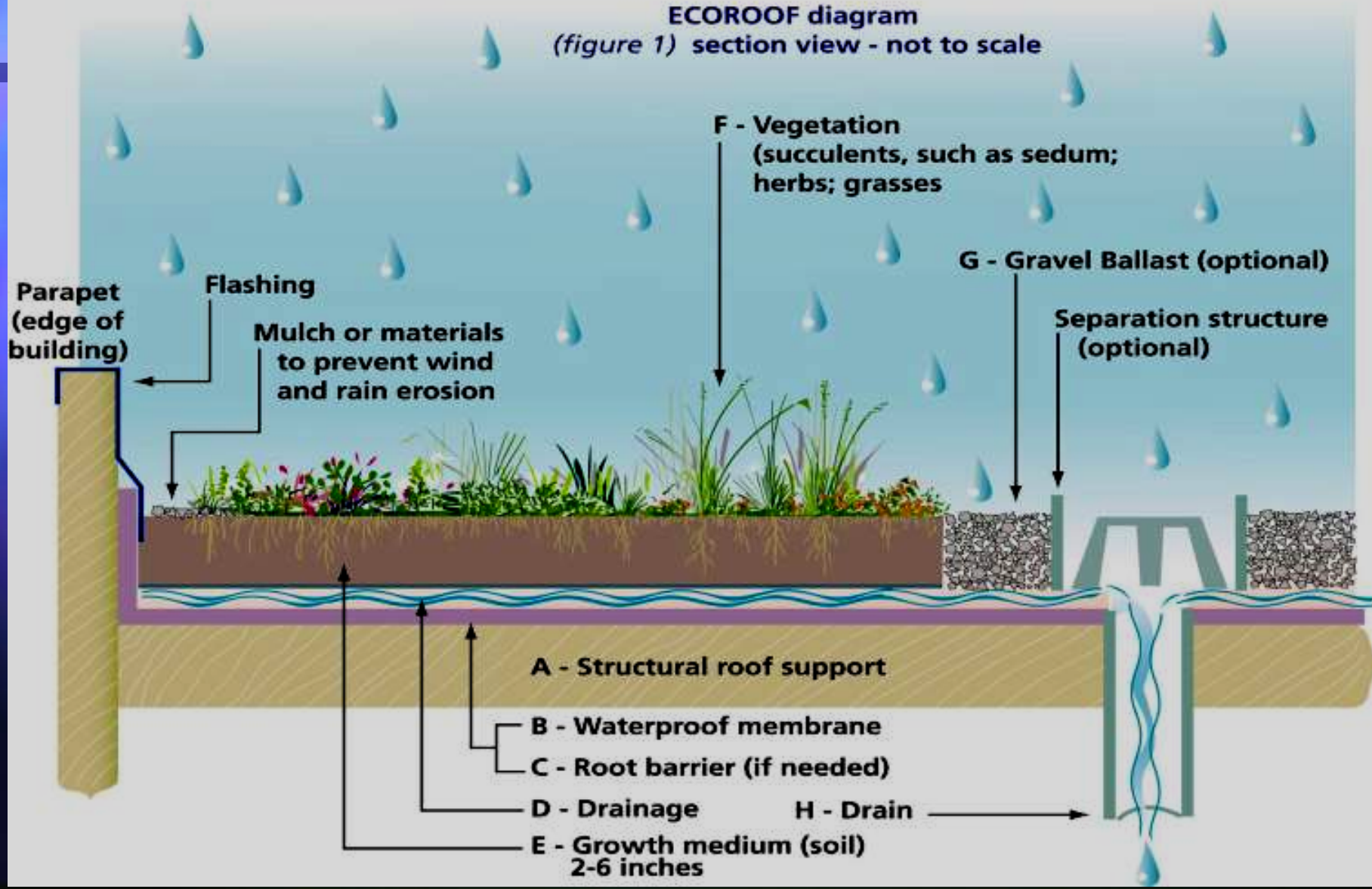


Davinci School Education Center



Ecoroofs...an alternative to conventional roofing...

ECOROOF diagram
(figure 1) section view - not to scale




Ecoroofs



2003 10 7

Brewery
Block #4
Ecoroof
2003



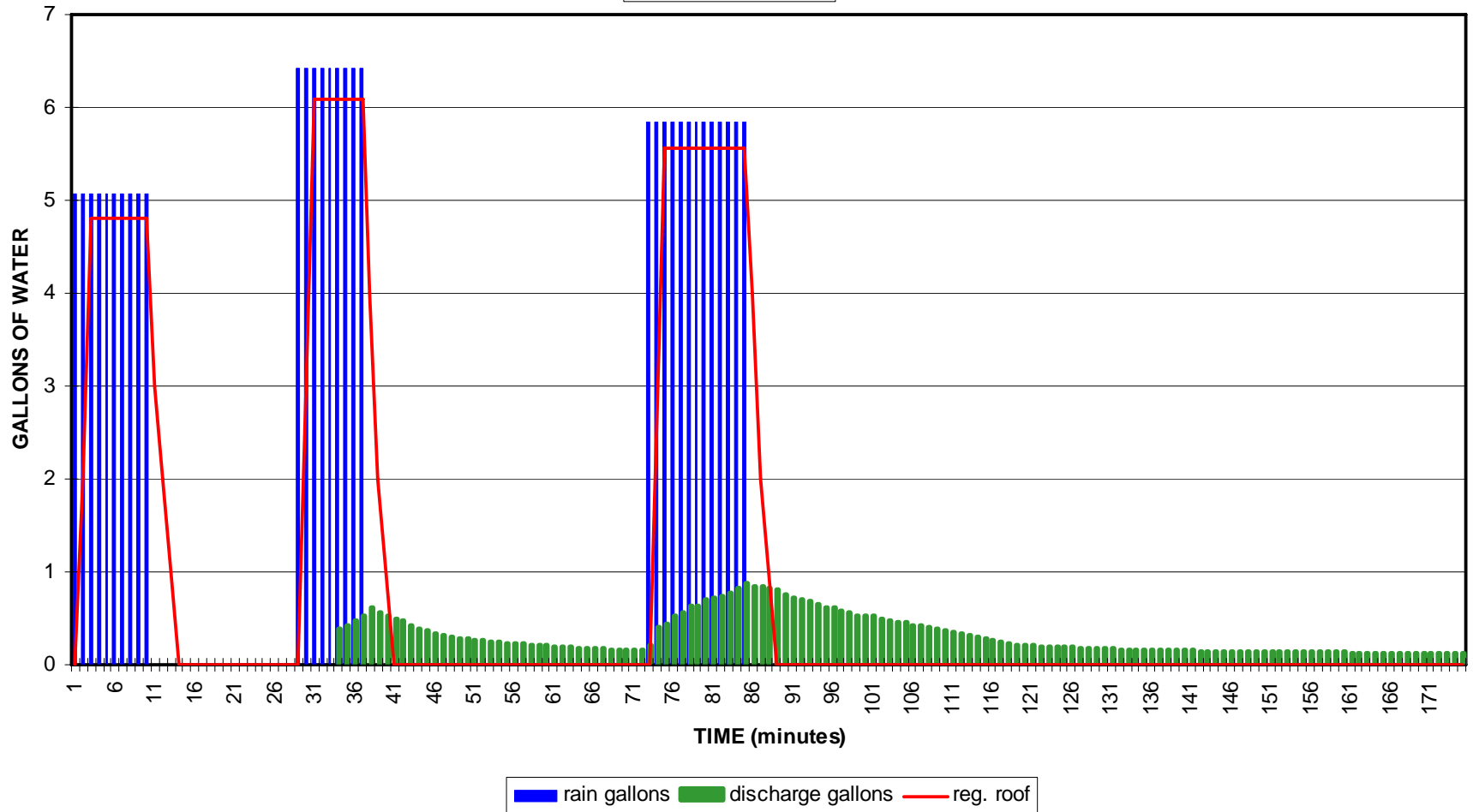


**First Ecoroof built to test Stormwater
management 1996 Portland, OR.,
monitored August 1997- December
1999**

MAY 12 2001

Garage Ecoroof Storm Simulation 1998

Garage Ecoroof
Storm Simulation
7/4/1998





Hamilton Apartments Ecoroof - 1999

first large scale stormwater monitoring and
education site in USA

MAY 8 2002

STORMWATER RETENTION

Jan. 2002 – April 2003:

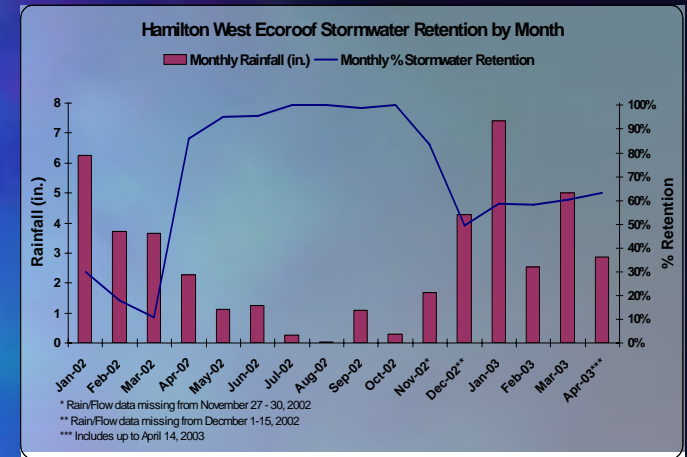
Average monthly 69%

Average all precipitation for 16 months 52.5%

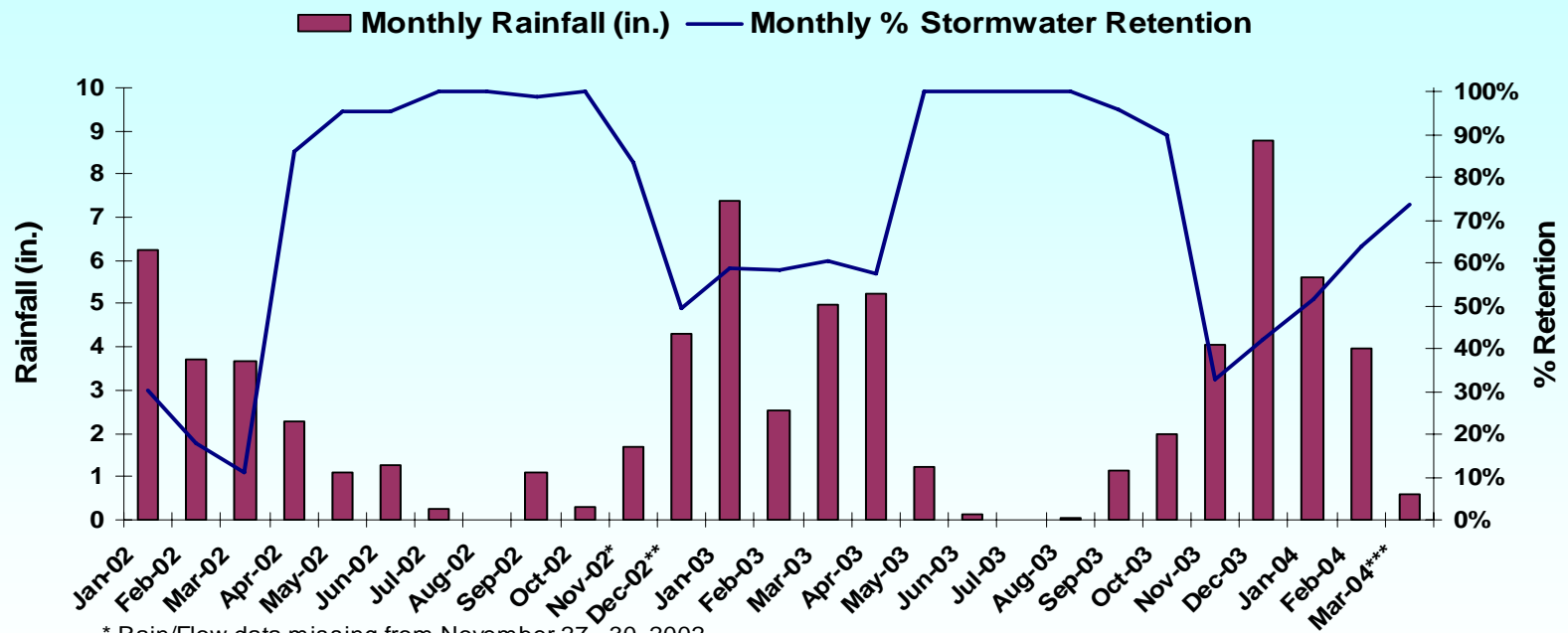
Jan. 2002 – March 2004:

Average monthly 71%

Average all precipitation for 27 months 53.5%



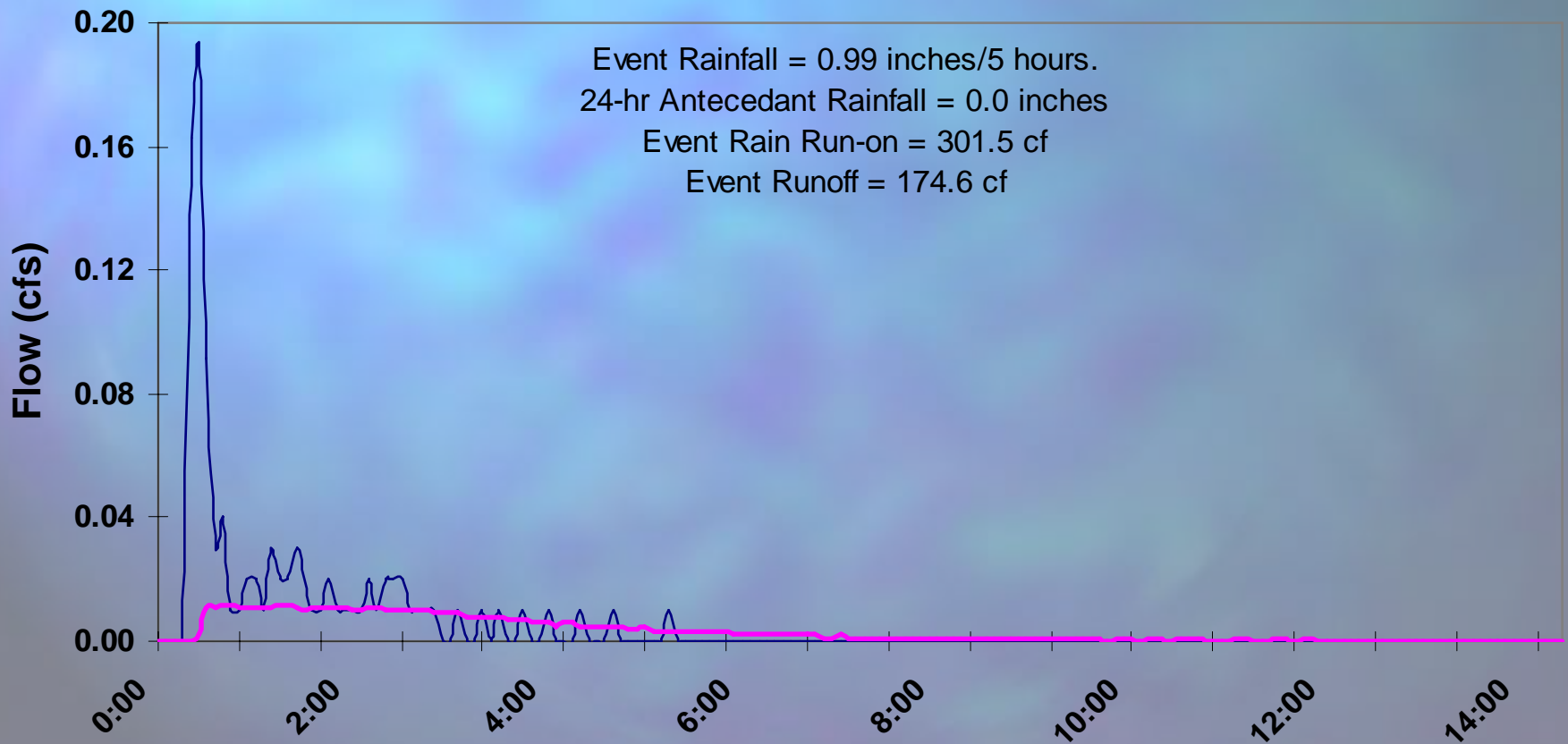
Hamilton West Ecoroof Stormwater Retention by Month



Westside Ecoroof Peak Intensity

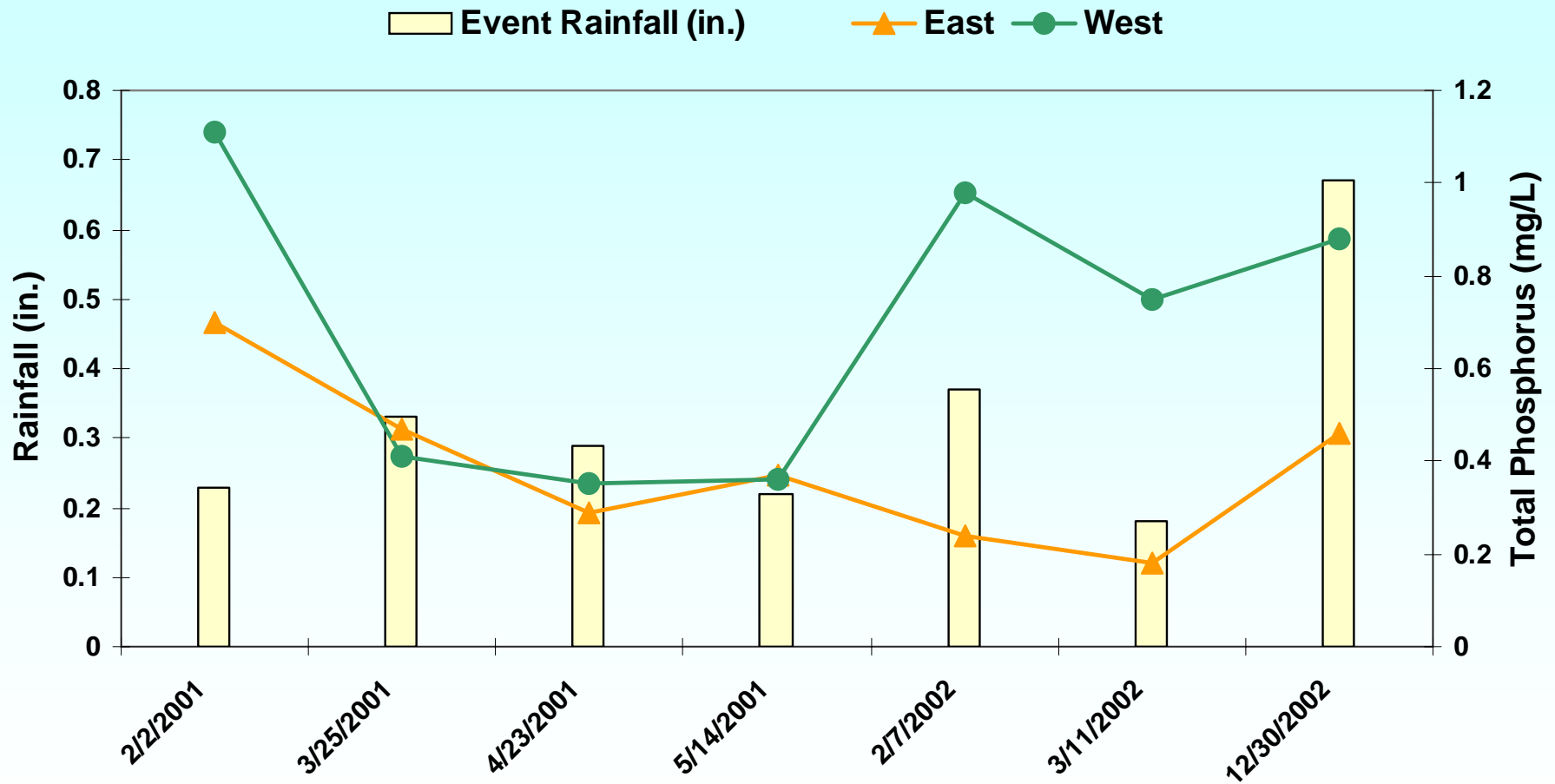
Hamilton West Ecoroof Rain and Flow Winter Storm Event ~10-yr: February 23, 2002

— Rain Run-on — Runoff



Hamilton Ecoroofs Water Quality

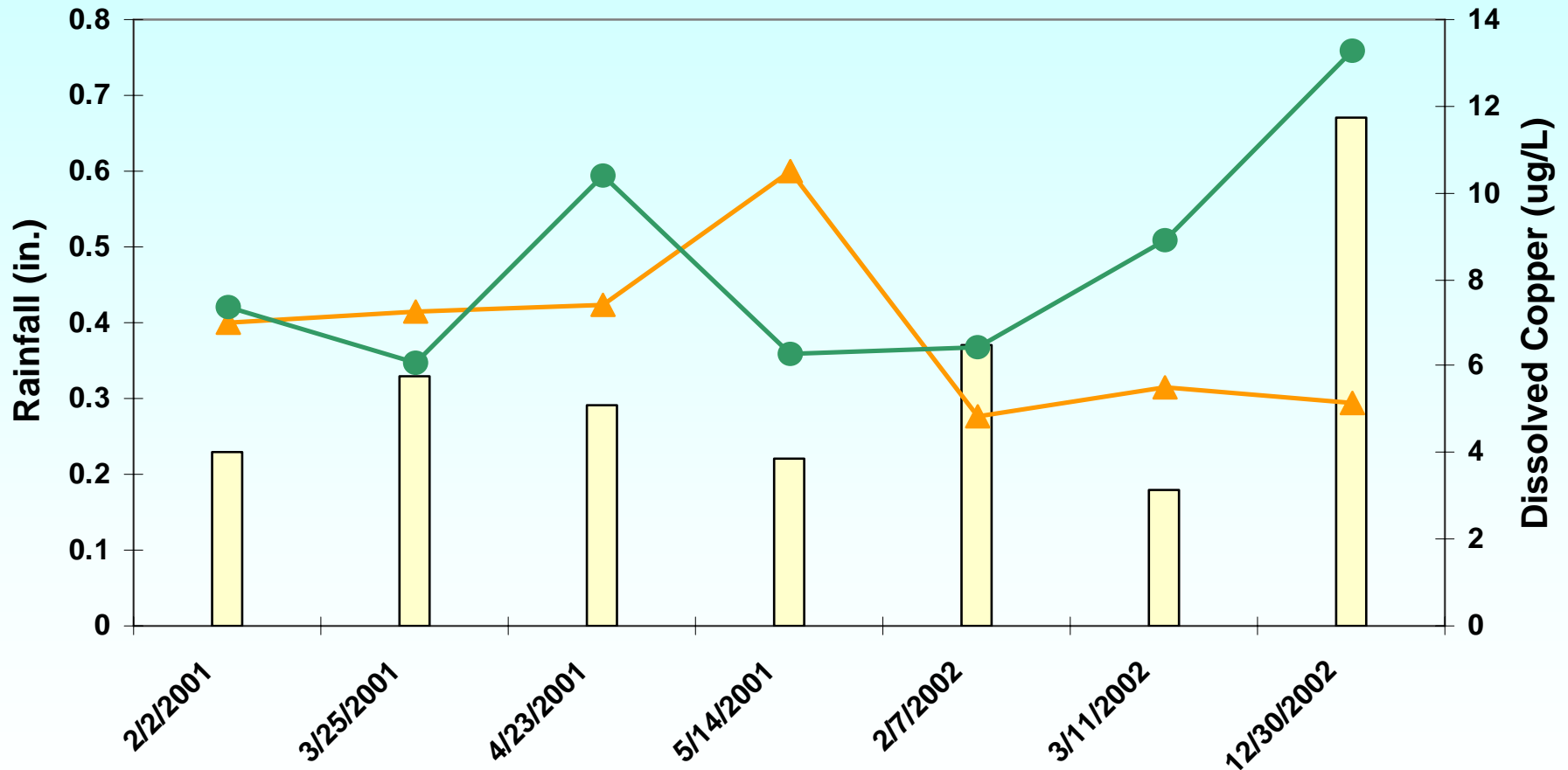
Hamilton Ecoroof Runoff
Total Phosphorus Concentrations



Hamilton Ecoroofs Water Quality

Hamilton Ecoroof Runoff Dissolved Copper Concentrations

Event Rainfall (in.) East West



Ecoroof Monitoring Results

- Average rainfall retention over 27 month period = 53.5%
- Average monthly retention 71%.
- Based on characteristics of ASFO Storm it was estimated that ecoroofs comparable to Hamilton would retain 50% of the ASFO storm.